Geophysical Research Abstracts
Vol. 15, EGU2013-7208, 2013
EGU General Assembly 2013

A canopy radiative transfer scheme with explicit FAPAR for the ISBA-A-gs land surface model: impact on carbon fluxes

Jean-Christophe Calvet, Dominique Carrer, Jean-Louis Roujean, and Sébastien Lafont
CNRM-GAME (Météo-France, CNRS), GMME/VEGEO, Toulouse, France (jean-christophe.calvet@meteo.fr)

The ISBA-A-gs land surface model is a component of the SURFEX modeling platform developed by Meteo-France, used for research and operational applications in meteorology, hydrology, and climate modeling. ISBA-A-gs simulates hourly water and CO_2 fluxes together with soil moisture. An option of the model permits the simulation of the vegetation biomass and of the leaf area index (LAI). The simulated photosynthesis depends on atmospheric CO_2 concentration, air temperature and humidity, soil moisture, radiant solar energy, the photosynthetic capacity of the leaves and on factors that condition the distribution of solar radiation over the leaves. In the original version of the model (Jacobs et al. (Agr. Forest Meteorol., 1996), Calvet et al. (Agr. Forest Meteorol., 1998)), the radiative transfer scheme within the canopy was implemented according to a self shading approach. The incident fluxes at the top of the canopy go through a multi-layer vegetation cover. Then, the attenuated flux in the PAR wavelength domain of each layer is used by the photosynthesis model to calculate the leaf net assimilation of CO_2 (An). The leaf-level An values are then integrated at the canopy level. In this study, an upgraded version of the radiative transfer model is implemented. An assessment of the vegetation transmittance functions and of various canopy light-response curves is made. The fluxes produced by the new version of ISBA-A-gs are evaluated using data from a number of FLUXNET forest sites. The new model presents systematically better scores than the previous version. Moreover, ISBA-A-gs is now able to simulate prognostic values of the fraction of absorbed PAR (FAPAR). As FAPAR can be observed from space, this new capability permits the validation of the model simulations at a global scale, and the integration of measured FAPAR values in the model through data assimilation techniques.